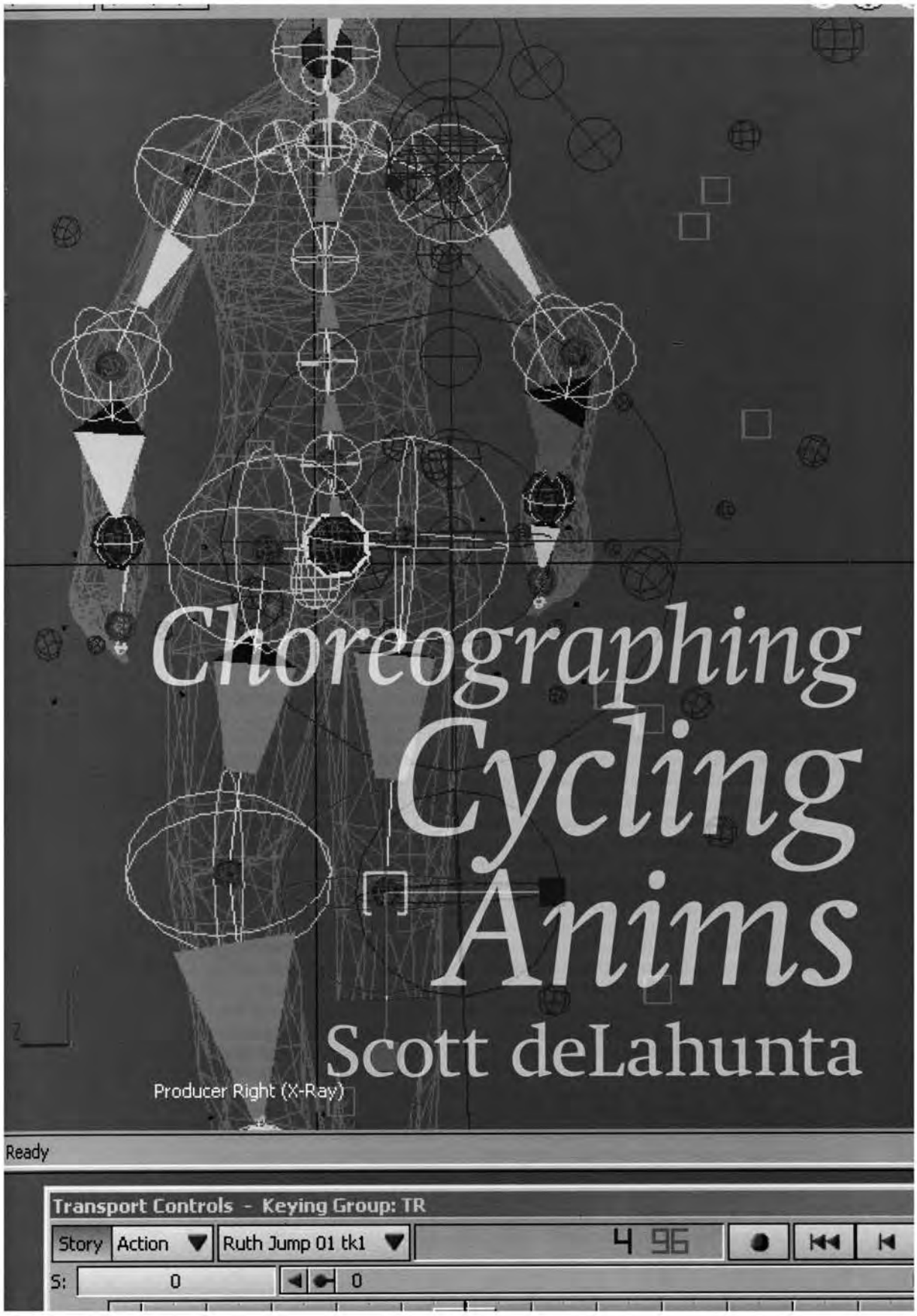
No. 29

‘Choreographing Cycling Anims’

in *SwanQuake. The User Manual*. ed. S. deLahunta. Plymouth: Liquid Press/i-DAT. 2008, pp. 17-26.

SwanQuake began with discussions with the artists (with whom I had worked on several other projects) in January 2004 about creating a game engine modification for an art work involving motion capture and choreography/ dance. I was invited to participate as writer on the project and a year later proposed the idea for the book which I edited. The essay included in this collection uses primary material from three key interviews with the artists John McCormick and Ruth Gibson in June 2005 and January and May 2007.

The User Manual opens the SwanQuake project up to discursive reflection and expansion through its selection of articles and essays. In the first section, the User Manual takes you through some of the processes of making SwanQuake including sound composition, choreography and computer animation work. Also in section one is a modicum of do-it-yourself instructions and two views on igloo's work in relation to the wider field of digital arts practice and culture. Source: http://www.swanquake.com/intro.htm (accessed 7 May 2010).


Choreographing
Cycling
Anims
Scott deLahunta
Producer Right (X-Ray)
Ready
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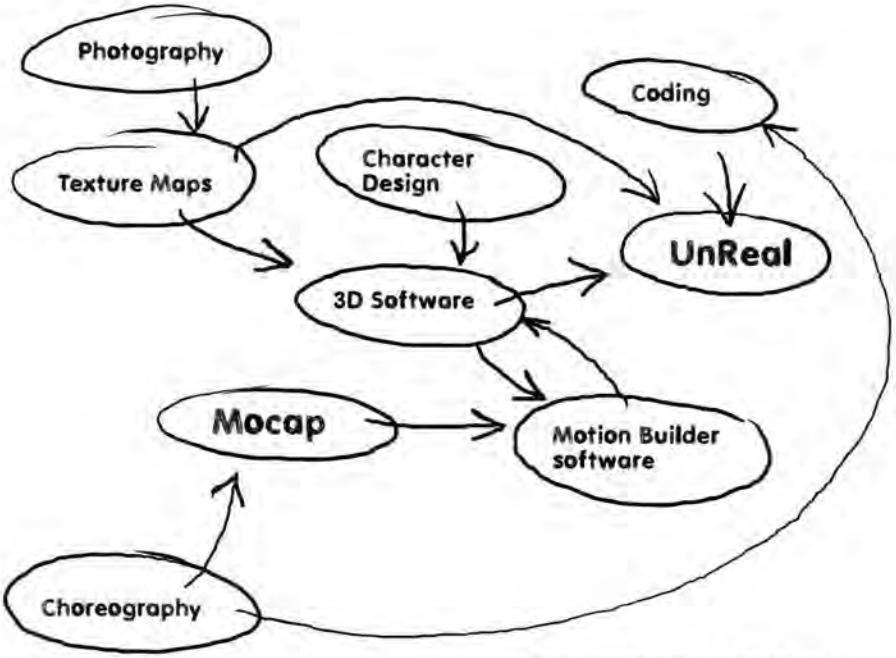
Hi John, I got a nice pipeline going on for matching the start/end poses on the Ruth NPC anims and I'm exporting them slowly to UnReal. But what is correct position for the hips? I am making them 0,0,0 but should I be making them so that the feet are on the floor?? - All the other stuff to do with exporting and getting into unreal is fine - not having any stretch problems and I've coded up a pawn and that's working, but it's 'bumping' up and down a bit. I've been playing with the numbers but can't figure it... It probably would be a whole heap easier if I could see the PC collision hull ... Bruno

(email from Bruno Martelli to John McCormick 02.02.07)

When one thinks of choreography the first image that comes to mind is a dancer moving across the stage with sharp and rhythmic gestures sometimes expressed by the whole body sometimes by the isolation of parts. Movements and gestures can originate from anywhere: the fingertip, the spine, top of the head, the foot or from a more interior impulse of an organ or the fluid systems of the body. The dancer may be and is often trained in the sense of having practiced a set of movements or gestures following some system of 'dance technique'; e.g. Classical Ballet, Cunningham, Bharatanatyam, Contact Improvisation. Dance techniques also express an aesthetic ideology or belief. A technique is in some way an idea about what dancing is; an idea made manifest through physicality. (Foster, 1992: 480-95) Dance technique provides a formative aesthetic background for dance making. The dancer embodies this aesthetic background, which the choreographer (who may also be the dancer) somehow uses, manipulates, reframes and/ or subverts. But trained or not the body on stage has cultural significance; and its very placement on a spot in that space, moving or not ('idling' in animation parlance), reflects a choreographic decision. (Lepecki, 2005)

While its most common usage may be in the context of the last paragraph, the term choreography may be found referring to the orchestration of other kinds of movement; from organised political demonstrations to synchronized swimming and message flow around the Internet.[1] In the process of creating *SwanQuake*, the choreography finds its genesis in the dancer's movements then runs iteratively through MoCap (short for 'motion capture'), character design, texture maps, photography and coding eventually arriving at its destination as scripts and objects in the database structures of the *Unreal* game engine. *Fig.1* The audience member who visits this computation space finds it modified for the purpose of the art of movement algorithmically 'rendered as image-movement', to poach a phrase from **Johannes Birringer's** summary elsewhere in this book.[2]

This essay will trace the choreographic story inside the *SwanQuake* project: from the preparation of the motion capture sessions to exploiting the core functionality of the game engine.[3] It will explore the possibilities for dance making when the 'virtual' or calculated properties of matter are available for choreographic decisions; what happens when these decisions are made along with new discoveries (and desires to return to an earlier stage in the process) in the face of a constantly evolving palette and proliferation of possibilities. The creation of *SwanQuake* has no parallel this author is aware of. In commercial animation the mandates of the market make it impossible to engage in such a long process; and compared to the few artistic works where motion capture, game engines and choreography have come together *SwanQuake* stands out, not least because the complicated technical learning required is almost entirely taken up by the core artists themselves. The result is a closer relationship with the materials that they seek to understand, control, manipulate and release. This has lead to the choreography in SwanQuake undergoing an unusual



Splash image Motion capture software
Fig. 1 *SwanQuake* production pipeline
Fig. 2 (below) key frames from *Daylight Robbery*

transformation; something this essay seeks to explore through reflecting on the ongoing dialogue the author has had with the project's main choreographers, **Ruth Gibson** and **John McCormick**.[4]

Artists' Background

Gibson began dancing at three years old and exploring her choreographic side when she was only eight. Over the next twenty years her passion didn't diminish as she participated in an eclectic range of dance activities including studying at the **School for New Dance Development** in Amsterdam in the late 1980s, an education programme renown for nurturing the most experimental of new dance in Europe at that time. Founding **igloo** with graphic and visual artist **Bruno Martelli** in 1995 was the start of a new period of creative work for Gibson, marked notably by igloo's use of 3-D motion capture technologies. As noted elsewhere in this book, that year they made their first joint work *Daylight Robbery*, using digital motion capture techniques at the time 'virtually unknown and untried by most dance artists'.[5] *Fig.2* Since then, Gibson and Martelli, often in collaboration with John McCormick, have developed an impressive and unique collection of art works that have made use of motion capture systems.[6]

3-D motion capture is a complicated technology combining hardware and software that is difficult to use without extensive learning. These are the same systems we read about being used in the making of film animation (such as *Lord of the Rings*) and scientific research into enhancing athletic performance. In the last ten years many contemporary choreographers have begun to explore

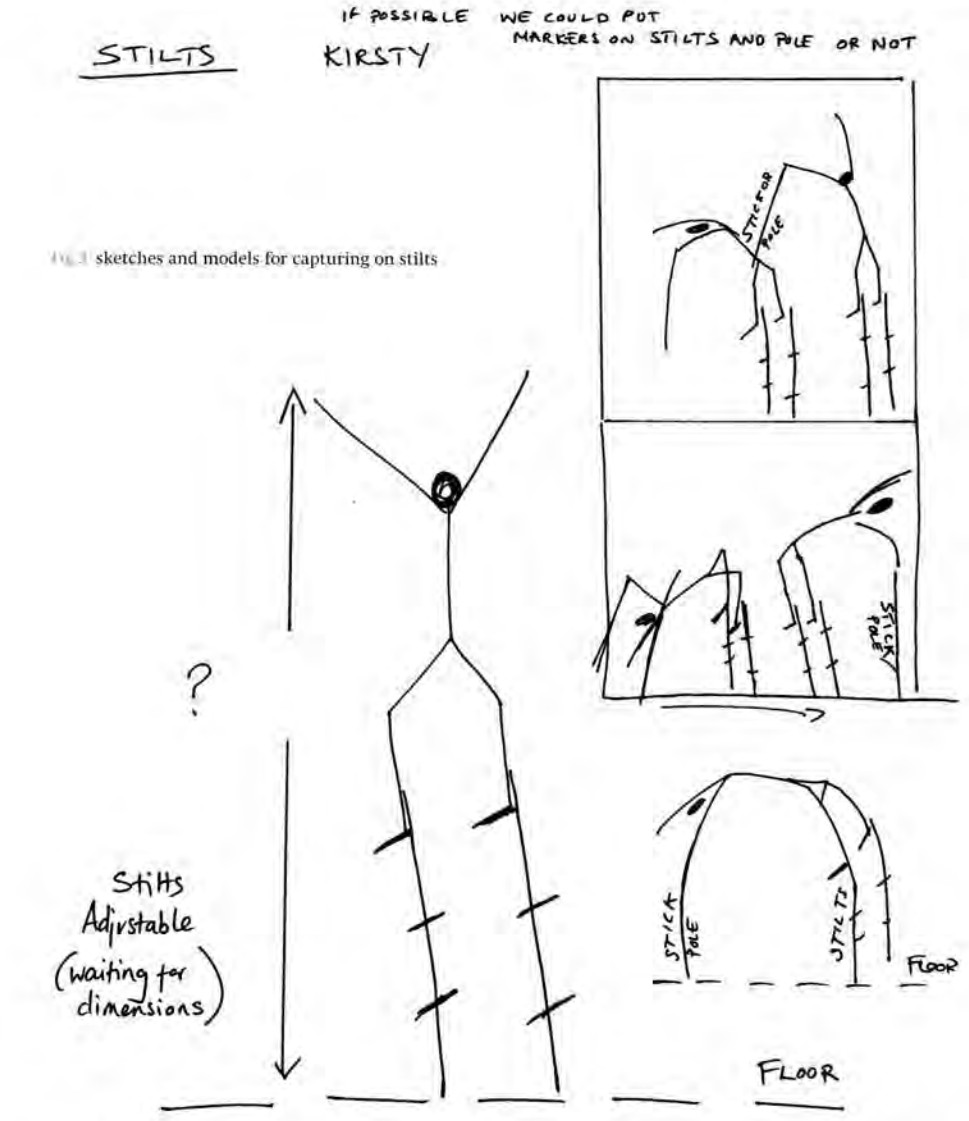
the artistic potential of motion capture. Gibson's considerable experience as a Motion Capture model and supervisor working with high-end companies including **Vicon UK** (Oxford), **BBC** (London), **Televirtual** (Norwich) and **Motek** (Amsterdam) gives her a unique understanding of what the systems are and are not capable of. With a background that includes dance studies at **Victoria College**, John McCormick has been integrating technology and dance as co-director of the Melbourne based **Company-in-Space** since 1992. From 1999, he has been working with full-body motion capture systems; accumulating experience that has few parallels today in the field of contemporary performance.[7] In early 2004, they began to work together on *SwanQuake*.

Motion Capture to Moving Characters

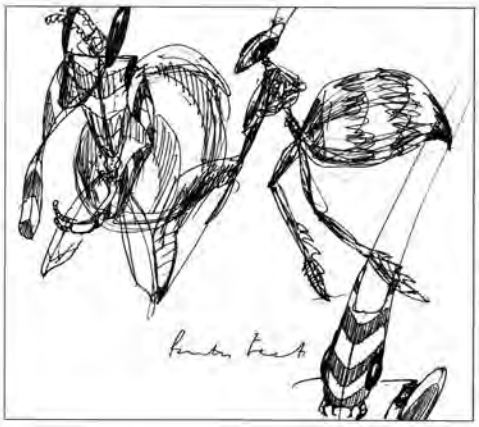
The main body of movement data came from three motion capture sessions each preceded by two weeks of rehearsal.[8] The two main capture sessions, April 2004 and 2005, used the indoor optical motion capture system of Motek in Amsterdam. Some decisions about the movement and gestures that would be captured were based on the types of characters, sounds, terrains and environments that were being created for the different levels. For example, for the character known as the 'insect', the plan was to capture movement of the dancer on stilts so that the leg lengths would fit to the modelled skeleton. Fig.3 The capture sessions were designed to optimize the palette of possible movement material to be used in the project. Improvisations were combined with learned phrases; and stock movements such as walking, crouching and running were recorded. In order to give the dancers a feeling for where their captured movements might end up, some of the graphic environments were projected and composer **Adam Nash's** *SwanQuake* soundscapes were played during capture sessions.[9]

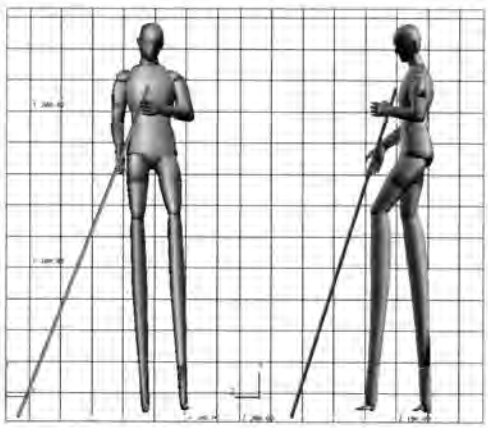
The first Motek session was generally more experimental resulting in material that was, according to Gibson, 'creative but unusuable'. (RG, 24.01.07) For the second they rehearsed more rigorously in order to obtain better data for their purpose. For example: ensuring the performers were starting and stopping in key positions and facings so that the phrases could be seamlessly joined together later in the animation process.[10] Spacing the capture sessions a year apart was 'a deliberate choice, so that there has been enough time to improve on the last, select and add more dancers and within reason try and anticipate/ forecast/ predict future developments of the work'. (RG, 20.05.07) In August 2005, after the second Motek session with the optical system, Martelli and Gibson had the opportunity to try a relatively new motion capture device called the Gypsy Gyro that uses rotation sensors on a wearable suit and has an extensive wireless range.[11] They used the Gypsy Gyro for capture sessions outside for another artwork entitled *Summerbranch* written about elsewhere in this book.[12] These outside captures were not intended initially for *SwanQuake*, but this changed over time for reasons that will be addressed later in this essay.

After the two first capture sessions, Gibson and McCormick were faced with the task of organising the motion capture data: naming and categorizing the hundreds of recorded motion fragments (lasting from twenty seconds to one minute) 'according to the different characters ... and style of movement for the different scenes'. The result is a library of movement and gesture data recorded in two spreadsheets. Each record includes a file name (e.g. D1_S3_TONI), the specific take (e.g. Toni birdman tk1.c3d), the anticipated character (e.g. birdman) and the environment (e.g. piranesi level). This initial assignment of a character and environment corresponded to the planning they had done prior to the capture sessions in Amsterdam. Both Gibson and McCormick stated that how the movement had been imagined 'as fitting into different characters,



sketches and models for capturing on stilts





might change' once they had a chance to see how the matches appeared. Already a degree of trial and error and serendipity was anticipated in what Gibson referred to as 'trying to get the cast... '.

Team members **Alex Jevremovic** and **Marshall White** were responsible for creating and building the characters in close collaboration with Bruno Martelli who was developing the various environments. Several characters have been made including **Elk Man, Mole Man, Space Man, Fox, Rabbit, Shadow and Insect Man**. Fig.4 Some of the characters have extensions such as antlers and antennae that accentuate the movement. As mentioned earlier, Insect Man has long legs for which motion capturing on stilts was attempted. The design of the characters themselves is a difficult and time-consuming process involving building a skeleton and geometry (the basic overall shape of the character) both of which need to be integrated with the motion that has been captured. The 'polygon' is the main, usually triangular, building block for the overall shape and form of an animated character. Counted as individual pieces, there can be thousands of polygons used in any individual 3-D object each joined at a 'seam' along their edges and referred to as the 'polygon mesh'.[13]

Fig. 4 Rabbit character model

At this point in their choreographic process (approximately June 2005), Gibson and McCormick were thinking in terms of being able to 'push any motion at the character at any time'. At the same time, the character designers were looking for the 'synergy between the motion and the geometry' and how these combined elements would work in the context of a specific environment.[14] This meant trying the motion capture material in different characters, and for this the team used a 'TESTBOX ... basically a cube to try stuff out in'. (RG, 21.04.07) Here they could get an idea of how the movement would look against different backgrounds, with different colours, texture maps and lighting.

One of the challenges for Jevremovic and White was creating characters that would not break the polygon mesh apart when performing particularly challenging movement material. To test the 'cohesion' of the characters, they sometimes used one of the motion-capture data files affectionately referred to as 'Julia's arse breaking motion'. Here the performer **Julia Griffin** was motion captured doing an extreme movement phrase involving a twisting arabesque that spirals to the floor. If this phrase broke up the character, the animator could increase the number of polygons or change the 'weighting' in particular polygons in the rupturing area to ensure that the character would work with all possible movements. However, this would add additional time-consuming work with no guarantee at this stage that the movement would end up as part of the choreography in the final work.

With so many variables in play at any one time, the team was constantly balancing the desire for choreographic experimentation (trial and error) against practical constraints. Creating the fully animated characters for *SwanQuake* or finding the 'cast', as Gibson referred to it, was a difficult back and forth process. The 'pipeline' is a commercial animation industry term for the entire motion-capture process from planning, recording, data processing and finally mapping and binding the motion to characters. In a commercial context, the

pipeline is designed so that the overall process is as efficient and cost-effective as possible. Figure one is an illustration of something akin to this concept of the 'pipeline' for the *SwanQuake* project; but that's where *SwanQuake*'s resemblance to a commercial project ends. When asked about the process of creating the choreography for *SwanQuake*, John McCormick responds, '... with normal game creation they absolutely wouldn't do it this way. They would have everything set at the very beginning and they would have to stick to it, just because of time and money'.

For the *SwanQuake* project time was relatively flexible and the date for the conclusion of the project open-ended. This meant that other projects began to inform *SwanQuake* developments. For example, *Summerbranch*, mentioned earlier, was finished and began touring successfully.[15] Some of the motion captured outside in August 2005 for *Summerbranch* started to look useable for the characters in *SwanQuake*. There were longer travelling sequences that worked better than joining together a number of shorter ones in the animation phase. Gibson also refers to an 'authenticity' that was the anticipated result of being captured on uneven terrain. (RG, 20.05.07) This was a unique quality not perceivable in the studio-based motion capture, and they recognised it could be used in *SwanQuake*.

Enter the Player/ Viewer

In a 3D computer game Player and Non-Player Characters (PC and NPC) co-exist in the game world together. The player or viewer controls the movement of the PC using standard game controllers, the mouse, keyboard and/ or joystick, and the actions of the NPC are often triggered by movements of the PC. For the *SwanQuake* project, this meant that after movement was selected for a character in its environment, the choreographic process would involve a set of decisions about these controls. As John McCormick explained in June 2005, 'when the player gets close to a character, the character starts performing those actions which can be a long sequence from all the combination of shorter sequences'. The trigger for these actions to start is programmed into the game engine. So which movements would happen in what order? Would it be possible to apply compositional ideas from the real to the virtual 3-D space? Could principles such as repetition, cannon, theme and variation, accumulation and counterpoint work in this context?

Remembering that hundreds of recorded movement fragments were stored in the motion capture database, with names like Courtly Dance, Shuffle Feet, Waltz, Arms into Whirls, Skull and Tail, Greek Bow and Insect Jump1, it would seem that an endless number of possible combinations could be strung together choreographically. Perhaps a random sequence generator could be programmed like an improvisation system devised by choreographers such as **Trisha Brown** and/ or **William Forsythe**. The viewer controlling the player character might approach the dancer or non-player characters from any direction, making the experience more like a site-specific work than something taking place in the proscenium theatre, like moving around a 'sculpture with moving parts'. (ibid)

But here connections between actual choreography and 'virtual' choreography start to break down. Much of the motion for the project was originally captured with the idea of choreographing or scripting action sequences that placed an emphasis on the qualities of gesture and shape of the movement itself. While this remained of critical importance, as evidenced by the use of the material captured out of doors, the choreographic focus shifted over time as Gibson and McCormick began to explore the interaction the PC (the player/ viewer) would

have with the NPC (e.g. Elkman, Moleman, Spaceman, etc.). They began to place more emphasis on the experience of the player/ viewer and on 'relationships and encounters' in the space and less on specific movements. They simplified the movement repertoire focusing on 'simple task stuff' such as moving chairs and furniture in the House level with the idea that the relationship between the animated characters and their environment might then appear to be more 'real'.

Their concept for the choreography changed along with a shift in possible 'movement' repertoire. For example, using animation techniques such as fade away meant that the slow disappearance of the non-player character could constitute a choreographic decision. The simple common looping player animations that transport the player character around became important movement material. The title of this essay refers to some of these 'cycling anims' with prosaic names such as CrouchB, FlyF, JumpTakeoff, RunF, WalkB and Swim Idle. They also started to look closely for the best moments of captured stillness in the motion files to use as 'idles'; for those moments when a character is still. As Gibson wrote, stillness isn't 'really still' and the player or viewer should be able to perceive the idling character breathing. (ibid) New ideas for motion, animation and interaction were also emerging through the learning involved in creating, touring and adapting *Summerbranch*. (RG, 24.01.07) The player/ viewer in the 3-D space might still trigger pre-scripted action sequences, but John and Ruth would base their choice of motion data from their motion capture libraries more on the 'quality of performance in the environments, player interaction and presentation' than on something resembling conventional choreographic principles.[16]

Scripting Behaviour

Moving into the final stages of building the first full environment of *SwanQuake* (the House environment), McCormick and Gibson are planning to use only a fraction of the original motion capture data. Instead they will bring into play the relational and 'behavioural aspects' of both player and non-player characters, seeking to create an uncanny experience for the player/ viewer through structuring simple encounters that accumulate meaning over time. (Table 1) Some of the original material created for the motion capture sessions seems to have had this in mind already; one dancer improvising by simply orbiting the other, advancing and retreating, with a high degree of awareness of each other. Gibson is also working with the materials provided by the project composers, **Luke Pither** and Adam Nash, to harness the sonic signatures of the different environments to accentuate and augment these encounters.[17]

Table 1: SwanQuake / Choreographic Possibilities
(from Ruth Gibson notes 20.05.07)

NPC characters **ambling** around (simple tasking) in their environment. When approached by the PC they might: a) run away; b) disappear c) act out a lyrical dance; d) group with others; e) advance; f) fade

NPC's **lyrically dancing** around in their environment when approached by the PC they might: a) start to simple task; b) keep repeating one cycle c) fade to stillness

NPC's **roaming** in their own environment might they: a) group b) escape the level; c) leak to another level; d) dance in unison

Summary

As mentioned earlier, the technologies of game engines and motion capture are difficult to force into unconventional processes, but the *SwanQuake*/ igloo team have worked hard for four years to surmount these challenges while maintaining an open-ended creation process. Theirs has been a unique journey of emergent choices and aesthetic discoveries.

> *If it were an ideal world I would go back to the motion capture studio and work out a few new phrases and movement vocabulary for the characters. ... However having said that, working within the limitations of a set library has given John and I some surprising choices at times'.* (RG, 20.05.07)

But how have dance and choreography been transformed throughout this long process?

In the introduction to this essay it is proposed that '... a (dance) technique is in some way an idea about what dancing is'. With this in mind, read the start of this email exchange in early 2007 between Martelli and McCormick:

> *'Hi John, I got a nice pipeline going on for matching the start/ end poses on the Ruth NPC anims and I'm exporting them slowly to UnReal. But what is the correct position for the hips?'*

What sort of idea about dancing is contained here? Perhaps it is an indication of a technique for composing the digital bits of dancing. But is it still choreography when collision hulls replace bodies and numbers direct motion?

During the first interviews for this essay, the discussion focused on the choreography of movement sequences for motion capture, followed by the mapping of these recorded movements to digital characters with the aim to eventually trigger them as action sequences. At this earlier stage, even though real movements and gestures had been translated into digital formats, the choreographic approach followed a line of thinking somewhat analogous to the process of making a dance for the actual stage. But this changed over time. Despite the title, *SwanQuake* was never intended to be experienced as a game, and the move away from the conventions of computer video gaming has only increased during the creation process. The choreographic approach has also steadily left behind concepts or principles derived from a live physical setting. Emerging from the overall design collaboration is something more akin to an orchestration of image, sound, immersion and experience folded together, aimed to elicit a mixture of feelings, curiosity and wonder. For the part that choreography now plays in this orchestration process, Gibson and McCormick have focused their attention on the generation of atmosphere, empathy and affect through odd encounters with sensible creatures; and for this they have created a pool of potential interactive relations between the player and the non-player characters. If the choreographic design in *SwanQuake* can be traced to the underlying codes of multiple possible digital renderings, its artful essence lies partly in the experience of unpredictability and 'not quite knowing where the control lies' in these uncanny interactions. (RG, 24.01.07)

> *We have post post post production going on here and John and I kind of toy with ideas and mull them over and leave them for a while to settle which I guess may seem casual from the outside but when we hit on something then we really know it's right as it's obvious to us. It's a bit like that with Bruno and I as well, a similar relationship, it's the same we don't necessarily have to talk to each other but we do take ages. When I'm working on a live piece I work at lightening speed, make quick decisions and chuck out the irrelevant.* (Note from Gibson 16 May 2007)

Notes

1. 'Choreography, in a Web services context, refers to specifications for how messages should flow among diverse, interconnected components and applications to ensure optimum interoperability.'
2. See in this book Johannes Birringer. 'Data Art & Interactive Landscapes'
3. 'A game engine is the core software component of a computer or video game or other interactive application with real-time graphics. It provides the underlying technologies, simplifies development, and often enables the game to run on multiple platforms such as game consoles and desktop operating systems' (Wikipedia/ Game Engine). For more on the evolution of the game engine in connection to artists see in this book Shiralee Saul and Helen Stuckey. 'Art is DOOMed: The Spawning of GameArt'.
4. All quotes attributed to John McCormick and Ruth Gibson, unless otherwise noted, are drawn from three main interviews: June 2005, January and May 2007.
5. See in this book Johannes Birringer. 'Data Art & Interactive Landscapes'.
6. For description of motion capture systems see igloo's website
7. For description of some of this work see Company-in-Space website
8. First session at Motek April 2004 with 8 cameras Vicon Optical. Performers: Julia Griffin and Kirsty Little. Second session at Motek April 2005 with 12 cameras Vicon Optical. Performers: Antonia Grove and Julia Griffin. Third session outside Gypsy Gyro, August 2005. Performer: Joanne Fong
9. See in this book Adam Nash. 'Real Time Art Engines 2: Sound in Games'.
10. Motion Blending is the term in 3-D human figure animation that refers to the seamless clipping together of sequences automatically; however the requirements of SwanQuake dictated that the team had to prepare this for manual production.
11. see Gypsy Gyro / Animazoo website
12. From igloo's website: ' Summerbranch explores movement and stillness in nature. Using camouflage and other disguises, a person or a computer character can blend into a 'natural' environment captured and treated through the moving image. This installation uses the tools of the military-entertainment complex, computer gaming, motion capture, 3D environments and special effects to question what is truth and what is artifice in our attempts to reproduce nature.' Also see in this book essays by Johannes Birringer, 'Data Art & Interactive Landscapes'; and Helen Sloan 'Cultural Resonance: Participation, audiences and interface'.
13. Because of the computing power needed to redraw these, if the object is also moving it means that an animated character in a real-time game has what is referred to as a 'polygon budget'. SwanQuake at the time of this essay had a polygon budget of approximately five to six thousand polygons per character.
14. Quote from conversation with Alex Jevremovic. See in this book: ' Pushing Polygons: interview Bruno Martelli and Alex Jevremovic'.
15. Most recently Summerbranch was featured in the New Forest Pavilion, 52nd International Art Exhibition, La Biennale de Veniezia (June/ July 2007).
16. This had in part to do with the fact that igloo had simultaneously been developing Summerbranch and had learned from the experience. (RG, 24.01.07)
17. 'My concerns are with the imperfections and the spaces between things, tonal & atonal, discordant & harmonic, sound organised in different relations to pitch, vibration and resonance.' (RG, 20.08.07)

References

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Lepecki, André (2005) / Exhausting Dance: performance and the politics of movement / London: Routledge
RG (2007-8) / Email communications between Ruth Gibson and Scott deLahunta / January, May 2007; August 2008

All links: www.swanquake.com/usermanual/ScottdeLahunta

Biography

Scott deLahunta works from his base in Amsterdam as a researcher, writer, consultant and organiser on a wide range of international projects bringing performing arts into conjunction with other disciplines and practices. He is an Associate Research Fellow at Dartington College of Arts and Research Fellow with the Art Theory and Research and Art Practice and Development Research Group, Amsterdam School for the Arts. He lectures on the Amsterdam Master of Choreography and serves on the editorial boards of Performance Research, Dance Theatre Journal and the International Journal of Performance and Digital Media.